AVIATION

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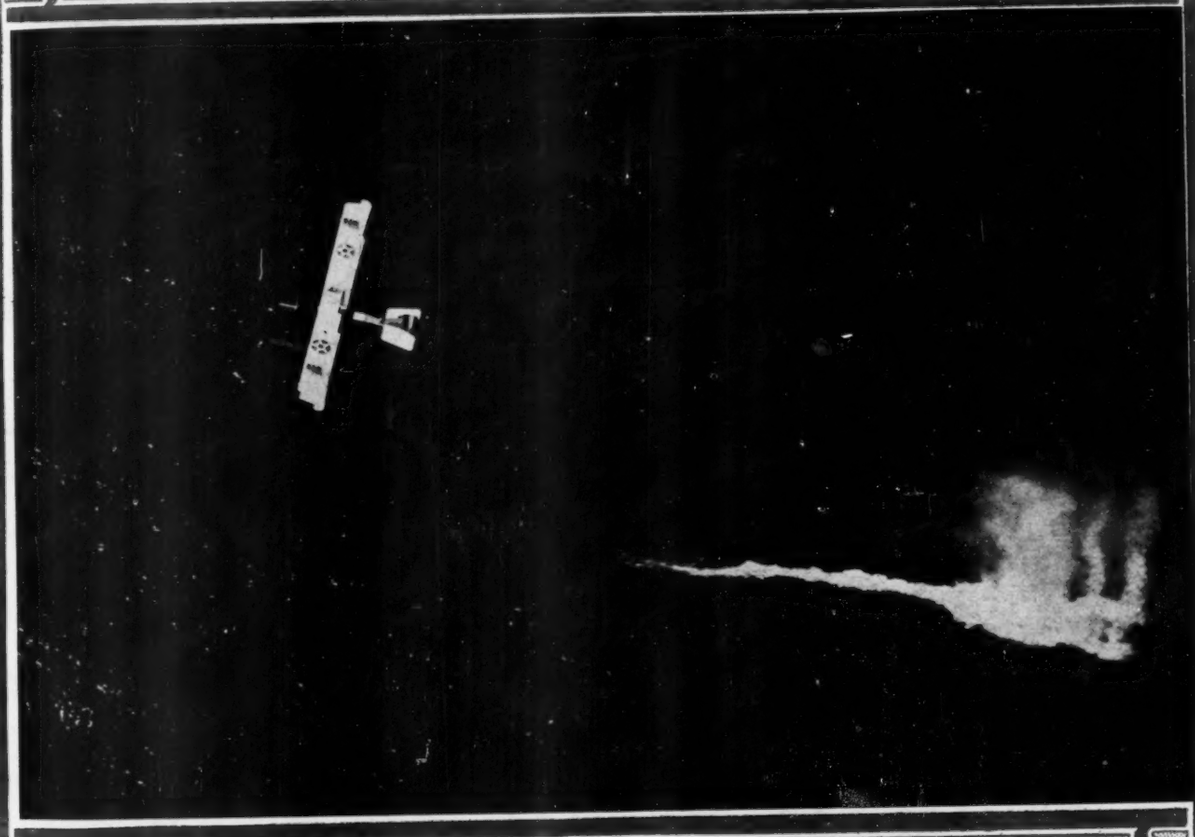

U. S. Navy torpedo plane dropping a torpedo

VOLUME XIV

Number 2

SPECIAL FEATURES

FOKKER AMPHIBIAN FLYING BOAT

THE WEATHER BUREAU AND AVIATION

ANNUAL REPORT ON THE ARMY AIR SERVICE

SUCCESSFUL DESIGN OF LIGHT WEIGHT METAL WINGS

THE GARDNER, MOFFAT CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

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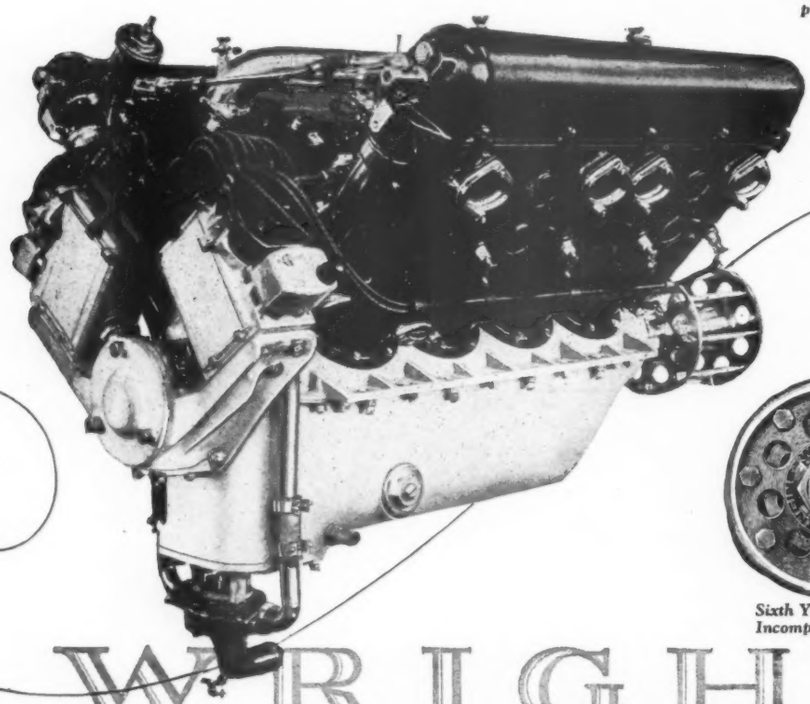

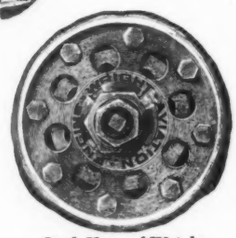

Sixth Year of Wright Incomparable Service

WRIGHT

JANUARY 8, 1923

AVIATION

VOL. XIV. NO. 2

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Vol. XIV JANUARY 8, 1923 No. 2

An Important F.A.I. Decision

IN aeronautical events such as competitions, races, etc. it has happened more than once that owing to external circumstances a situation arose which was not provided for in the F.A.I. rules. An already classic case of this kind is afforded by the long-drawn controversy between the Aero Clubs of France and Italy as to who should be declared the winner of the 1921 Michelin Trophy, which has now definitely been settled by the F.A.I. in favor of Italy.

The controversy arose from the following. The rules for the 1921 Michelin Trophy provided that a circuit of 3000 kilometers with fifteen obligatory landings and return to the starting place should be covered in the least elapsed time. Poirée, the French pilot, covered the circuit as prescribed in 37 hr. 13 min. Somewhat later Captain Martinetti covered an equivalent circuit in Italy in 35 hr. 45 min., but failed to land at his starting place because the contest official signalled him from the ground to land at a nearby field. The official decided upon this measure for reasons of safety, for the starting airdrome had in the meantime been flooded by rains. The question arose then whether the F.A.I. contest official had the right to alter the racing rules in the interest of safety, and whether such an alteration of the rules did not automatically annul the performance.

The French and Italian Aero Clubs took opposite views on the subject, and after an arbitral college had failed to solve the question, it remained for the F.A.I., as the supreme sporting authority, to decide the matter. This the F.A.I. did at its recent conference in Rome, where after an involved discussion in which the Italian viewpoint prevailed, it was voted that contest officials have the right to prevent a landing prescribed in the racing rules of a contest if they deem it justified. As a result Captain Martinetti was declared winner of the 1921 Michelin Trophy.

The decision of the F.A.I. was arrived at by a sufficient majority vote to show that such was the preponderant opinion of the clubs represented. The motion with respect to the powers of contest officials was passed with a two-thirds vote (including the American representatives); the motion as to the validity of the performance in such case received 28 ayes, 9 noes, and 5 abstentions. The American representatives voted in the affirmative.

We cannot but help feeling that this decision constitutes a dangerous precedent. If the application of racing rules is left to the judgment of the contest officials, and the performance so arrived at still remains valid, it will obviously cause a totally unjustified handicap to those contestants who carry out the performance under the conditions specified in the rules. However sympathetic the case of Captain Martinetti may appear in view of the fact that he made a very fine performance under extremely adverse weather conditions, it seems to us that contest rules are made for one purpose only: *to be strictly observed.* It is only thus that performances can be compared on the basis of a common figure of merit. Any other procedure falsifies the elements entering the calculations.

The decision of the F.A.I. is the more regrettable as the wording of the motion relative to the powers of contest officials is extremely ambiguous in the French (official) text, and so it is apt to lead to varied and contradictory interpretations. It seems desirable that the National Aeronautic Association take up this matter without delay in order that it may make suitable suggestions to clarify the text at the next conference of the F.A.I.

Air Service and Air Force

GENERAL PATRICK in his annual report on the Army Air Service makes a clear distinction between "air service" and "air force". These two terms have been loosely used for some time, which often has served to befog the issues. The definite meaning the Chief of Air Service has given these two terms is therefore to be welcomed.

The report says in this respect:

"A study of the tactical and strategical employment of aviation discloses two distinct classifications of military air power—'air service' and 'air force.' The air 'service' of any Army is made up of its observation units, the functions of which are to carry on visual and photographic reconnaissance, to locate enemy targets, to adjust artillery fire, and to carry on contact patrol and other liaison with the Infantry. Observation is never offensive and engages in combat only as a means of self-defense when attacked by the hostile aircraft.

"Air 'force' is made up of pursuit, bombardment, and attack aviation and is purely offensive in each of these arms. Pursuit aviation seeks to destroy enemy aircraft of all types, protects friendly observation, bombardment, and attack airplanes from hostile aircraft, and assists in attacking ground troops and other objectives in the theater of operations. The mission of bombardment is to destroy military objectives, both in the theater of operations and in the enemy's zone of interior. Attack aviation is designed solely for the purpose of harassing enemy ground troops from a low altitude by means of machine guns and fragmentation bombs, and such airplanes are heavily armored as a defense against machine-gun and antiaircraft fire from the ground. Neither attack nor bombardment seek combat in the air, and engage with hostile aircraft only as a defensive measure.

"In a properly balanced air service 20 per cent of the total strength should be made up of observation units and the remaining 80 per cent devoted to 'air force' or combat aviation."

To the public, the name "air service" has indicated an auxiliary arm of the other military forces. "Air force" can now be read with definiteness and a clear idea of its meaning.

Successful Design of Light Weight Metal Wings

Metal Wing Frames Built for Navy HS3 Flying Boat Give Excellent Results in Tests at Naval Factory

In Feb., 1920 the United States Navy invited bids for furnishing two sets of experimental all metal wing frames for an HS3 flying boat, and in May of the same year awarded a contract to Charles Ward Hall, Inc., New York, to design and furnish these. Three generally similar designs were submitted with bid, one involving the use of duralumin throughout with steel for wires only, the others based upon the use of steel tubing for spars and struts, with steel wires and duralumin ribs and edges. The Navy selected the design involving the use of duralumin throughout, but after waiting a year for the delivery of the tubing required for spar construction, steel tubing was substituted therefore, and the first wing set completed and shipped Jan. 11, 1922. The second set was completed April 26, 1922.

The guaranteed weight of the complete wing frames was 872 lb. plus a manufacturing allowance of 25 per cent. The weight of the wings as shipped was 852 lb., including nonskid planes and their wires at 8 lb., which were not originally estimated. The weight saving within the guarantee was due mainly to refinement of the spar joints, refinement of the strut fittings, and by use of thinner sheet for the nose stiffener, all of which changes were justified by detail tests.

Sand Tests

The wings as shipped to the Naval Aircraft Factory, Navy Yard, Philadelphia, were first set up on an HS2 hull and proved to be free of any errors in dimensions, they were next set up on a testing jig and sand loaded pursuant to Navy Technical Note 107 as viz: uniform distribution along the span, the forward 60 per cent of the chord uniformly loaded with 80 per cent of the weight, the after 40 per cent of the chord with 20 per cent of the weight: the ratio of unit loads for upper and for lower wings being 11 to 9. The average chord was inclined at 15 deg. to the horizontal, leading edge uppermost. Loads were applied in units up to the fifth load, and thereafter in one-half units to a factor of six. Readings for deflections, both vertical and horizontal, were taken at all panel points, and on the spars midway between panels. Extensometer readings on lift, incidence and external bracing wires were also made.

The deflections were consistent and substantially uniform throughout the test. Under maximum load the average vertical deflection of the upper front spar at most outboard lift wire was 2⅞ in.; the corresponding point on the rear spars deflected 3¼ in.: at the outermost strut the average deflection due to drift was 1-5/16 in.

Upon removal of the sixth load factor no measurable permanent set was found, nor were any details of the wing structure injured or deformed by the loading.

Under a separate contract this sand loaded set of metal wings have been conditioned and accepted for flying service, a very creditable performance when it is considered that the weight thereof was only 65 per cent of that of their wooden counterparts.

Trial flights at Philadelphia Navy Yard showed a high speed of 90 m.p.h. against 85 m.p.h. for the wooden wings; climb to over 6000 ft. before the rate of climb dropped below 100 ft. per min.; and climb to 7400 ft. in 30 min.

Principles of Design

The reasons for this remarkable performance do not lie in a mere change of material; but in a thorough and complete analysis of the actual stresses due to loading, including all secondary effects; and in the correct proportioning of the parts thereto.

In the order of their relative importance these causes may be stated as viz:

(*A.*) The balancing of one secondary stress against another in such manner as to cancel both, or to cancel one and to materially reduce the other of them wherever practicable. The introduction of secondary stresses to relieve the free edges of unsymmetrical sections. Wherever secondary stresses cannot be utilized to advantage, the elimination of them by use of concentric joints or otherwise.

(*B.*) The use of a strictly uniform factor of safety throughout, having due regard for the true stress maxima to which any part might be subject in any condition of flight or landing. No detail too small or too inconspicuous to receive full consideration.

(*C.*) The use of cross sections of 100 per cent efficiency throughout, save only where the bulk of material required does not permit of such sections, and for these the use of the most efficient section available.

A few examples of these principles of design are shown in the accompanying illustrations:

Fig. 1 shows one of the lower inboard wing panels completely assembled, a similar general arrangement pertains to all panels. The spars are built up of six mild steel tubes for chords with a lattice web system also of steel tubing. The drag wires are steel as made by the Stewart Hartshorn Co. All other parts are duralumin, the drag struts being 1½ in. or 1¼ in. outside diameter and varying in wall thickness to correspond to the loads sustained.

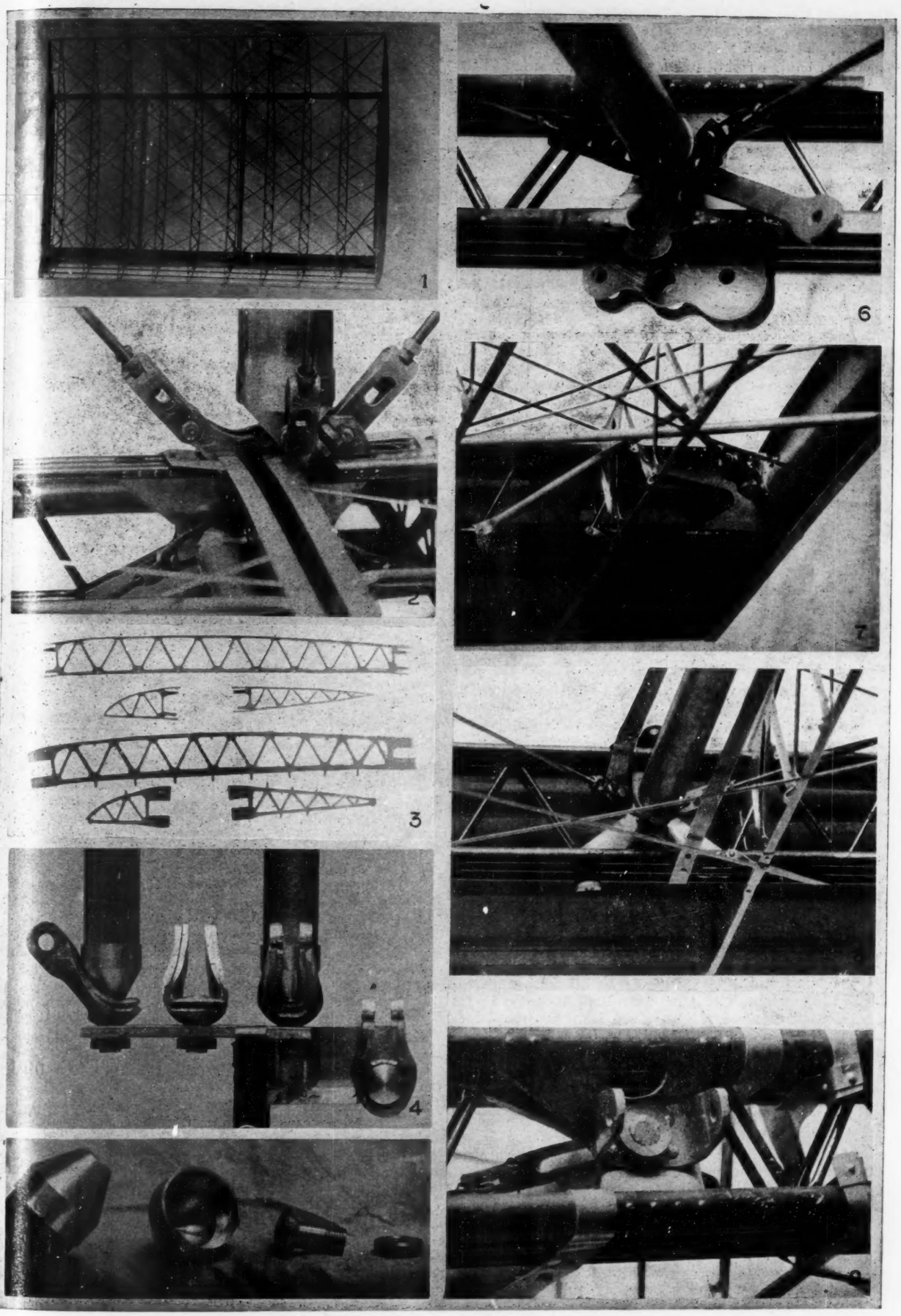
Ribs are punched and pressed from duralumin sheet, for convenience in assembly having been made in three sections; they are braced sidewise by lacings of duralumin sheet ¼ in. by 0.02 in. in cross section. The leading and trailing edges as also the nose stiffener are drawn to special forms from sheet.

Wing Panel Connections

In the connection of one wing panel to the next it has been customary to use a horizontal pin passing through the center of gravity of the spar section and so resulting in a zero bending moment at the panel ends. In these wings this pin is horizontal, but is so far eccentric to the gravity axis of the spar that the product of its eccentricity by the end thrust or tension along the spar, results in the same bending moment at the panel joints as would have occurred if no joint were present. This has the effect of reducing the support moments and increasing the center moments in adjoining panels, (see Fig. 2). Substantial increase in the ratio of weight carried to weight of structure results.

Truss members such as spars, being subject both to end load and to bending, are necessarily deflected thereby. If originally straight between the panel-points the bending moment due to column action is additive to and increases with the bending due to beam action, and at full loads becomes a large proportion of the total. In these spars a sinusoidal curvature, or camber, contrary in sense to that produced by the beam loading, is used, its amount being such that under maximum stress conditions the member is straight. This, with proper proportions in details, practically eliminates the l/r factor for column action, in the plane of spar webs, and results in marked weight saving.

Another method of obtaining a corresponding result by a shift or bending of the gravity axis of the member instead of curving the member as a whole is shown in the photograph Fig. 3, and other pictures of rib details; by reducing the width of the sheet near the ends as compared to the width at the middle of the web members, the usual tendency of angle sections to fail either by an outward opening of the angle legs or by a sidewise bending of the angle as a whole, is counteracted and the free edges of the section relieved of maximum stress. Sections so proportioned usually fail by twisting instead of bending, and at a much higher average unit stress.



The upper three parts of Fig. 3 show the rib after pressing to form, riveting the reinforcing lugs, punched to receive spar tubes, and trimming off of surplus material.

The use of cupped forked straps straddling a ball head bolt shown in all photographs of joint details, but particularly in Fig. 4, results not merely in enabling the use of a smaller diameter bolt. In fact the chief weight saving results in the reduced proportions of the web plates which transmit a direct push or pull, without twist, to the spar chords; and in the weight of the spar chords as well. For instance, only ¼ in. of eccentricity in the lead of a No. 5 Hartshorn wire might produce a bending moment of 1425 in. lb., in the plates and in the spar; and if in the drift plane, contribute a large proportion of the total bending moment in the case of a small machine. The total weight saving is far more considerable than might be inferred from a casual glance at this rather simple fitting.

Terminals at Spar Joints

The principles of design below noted for this single wire terminal apply also to all of the more complex terminals shown by the spar joint detail photographs. It will be seen that the strap is deeply cupped at the center to spherical form, its interior fitting the spherical inner side of the bolt head. Two forks lead off from widely separated points on the rim of this cup, conformably to the lead of the wire so that its line of action intersects the axis of the bolt at the bolt head. While the use of a ball head instead of a standard bolt to secure a flat strap having an angular lead represents a considerable reduction of bending stress on the bolt as compared with a lead past a flat head bolt, the device here illustrated entirely eliminates this bending stress, and for angles of lead of about 45 deg. to the bolt axis, the strength of the bolt is practically twice that in the usual ball head arrangement. For more acute angles the relief is proportionately greater. When used in connection with a strut bearing upon the outer spherical bolt head surface the stress in the bolt is pure shear and tests prove the bolt to have realized the full shearing value of the material.

Fig. 5 shows drift tube sockets. These sockets are used in two sizes: 1½ in. diameter, weighing 1.0 oz., with breaking strength of 12,750 lb. applied as in use; and 1¼ in. diameter, weighing 0.6 oz., with breaking strength of 10,000 lb.

For duralumin, the ratio of shearing strength to tensile strength is low as compared to the like properties of steel. Cone shaped compression tips for tubular struts as usually designed fail in shear and bending, the more pointed parts telescoping through those of larger diameter.

Through consideration of the underlying fundamentals it was possible to design the cone fitting shown in Figs. 4 and 5 which are used for all drift strut ends, wherein the type of failure has been changed from shearing to tension, four symmetrical longitudinal cracks developing upon the outer surface of the cone as the first indication of failure. The weight for like strength of these fittings is about one-third that of such fittings of usual proportions.

Eccentricity of connections, except where useful as above noted, has been eliminated by the device of fully concentric joints. In joint shown in Fig. 6 the lines of action of the spar, of the drift strut, the drift wire and its counter, the incidence wire, the interplane strut, the lift wires and a stay rod to the engine bed all center in a common point, the ball head bolt passing through the joint plate.

Panel Joints

The panel end shown in Fig. 7, where the load transmitted being large, the gusset plates are conspicuously tapered and resilient at their contact with the diagonal web system, demonstrates one of the causes of the light weight and high strength of the HS3 metal wings. Another method of assuring such resiliency at joints is shown in Fig. 8, typical of all drift panel joints, in which the Y shaped plates not only are lighter than rectangular ones would be but diminish secondary stress in the spar chords adjoining.

The use of external control wires leading from the front spars to the aileron horns unavoidably produces torsional stress in these spars; accordingly the ailerons are mounted upon brackets projecting from the rear spars to such a distance that the aileron loading produces a torsional moment therein equal to that in the front spars, and the lower chord of the front spar being attached by tension bands to the upper chord of the rear spar, and vice versa, by balance completely eliminates this torsion. (See Figs. 7 and 8). Bent lugs on upper and lower edge of joint plate attach to pulleys for aileron control. The aileron horn hinge fits between the ends of the U shaped lug as shown in Fig. 9.

It is obvious that the stresses sustained by various parts of the same class in any wing structure vary greatly. Until recently, however, there appears to have been little if any tendency to proportion the parts to the stress. Interplane struts of biplanes have usually weighed nearly as much when near the wing tips as when near the center; the same cross sections have been used for lower as for upper spars, and but little if any change of cross section has been made along the length of the spars, even with biplanes of high aspect ratio. Ribs have usually had uniform size cap strips from end to end, and if trussed the web members were all of one size.

In many airplane parts there is a distinct maximum of the combined stresses due to axial and bending loads at the panel points, in wooden construction this is commonly provided for by interrupting the spar routing at such points. This addition to cross section is inefficient, being an increment to the web member and not to the chords, which latter carry the peak load of the stress.

A method of reinforcing the chords at the panel points by overlapping the tubing of adjoining panels, suitably tapering the thickness of the tube walls to a feather edge at the tips and sweating together with solder, results in a joint that develops the full strength of the tubes. It also affords any desired cross sectional area over the supports without increase of weight at any other places. (See Fig. 6).

It is essential to taper the thickness of the tube walls so gradually that increase of the strength thereof in a given length is less than the bonding value of the solder for the same length. To afford the incidence wire anchorage a concentric lead one chord tube is flattened about half way. It will be noted that where this device is employed the least stressed of the tubes is the one flattened; that is to say, the tube in which the bending stress due to lift or both lift and drift is of opposite sign to the axial stress resulting from its position in the wing truss entire.

Rib Construction

For the rib proportions note particularly on the blanks (the three lower parts of Fig. 3) the variation in size of the truss members, the large tapering fillets which connect the web members to each other and to the chords the lugs at each panel point which bend up and are riveted to the web fillets to brace the outer edge of the lower chord of center part, of the upper chord of nose part and of both chords of tail part. The effect of these riveted lugs is to increase the strength of such a rib to 60 per cent more than the strength of a like rib not having them. The five lugs on inner edges of the center part which after bending perpendicular to the plane of the rib are riveted to the diagonal lacing. The cross section of the web members is curved to approximately parabolic form, the cross section of the chords is likewise curved throughout. The weight of each rib is 6.61 oz., and they have carried distributed loads under test of 500 lb., equivalent to 73 lb. of load per 1 oz. of rib weight. Other ribs of this type have developed a strength of 120 lb. of load carried per 1 oz. of rib weight.

The net result of these refinements is a structure wherein the joints weigh less than 2½ per cent of the total instead of 15 per cent or more as is common in engineering structures, and 25 per cent or upward in some wooden airplanes.

Wherever possible, tubes of circular cross section have been used for members and parts subject to compression or bending or torsion. For the resisting of torsion or of pure compression a single tube of appropriate thickness and diameter, is, if unperforated, 100 per cent efficient. Where, as in spars, there is considerable bending stress combined with more or less compression, the single tube cannot in most cases compete in efficiency with a trussed form of construction.

For a large plane some tubular combination is doubtless

the most efficient for rib sections, but in as small ribs as the R.A.F. 6 section of 6 ft. 3 in. chord, tubular ribs are unavoidably heavier than those of the type of design used in the HS3 metal wings. The stamped and pressed ribs make a good quantity production job, and as they support from 70 to 120 lb. of distributed load per ounce of rib weight they are twice to thrice as efficient as the wooden ribs in use.

The use of a torsional tube for aileron control, by the elimination of one of the four sets of horns used on the wooden HS3 ailerons, and the omission of all the external bracing wires while not unduly increasing the aileron weight, is believed to afford in reduced resistance the aerodynamic equivalent of several hundred pounds of weight saving.

A comparison of the weights of the metal and the wooden HS3 wings is made in the table which follows:

	Lb. for wood construction		*Lb. for metal construction*	
	Total	*per sq. ft.*	*Total*	*per sq. ft.*
Upper wing panels (without ailerons)	575.	1.57	370.	.988
Lower wing panels	354.	1.03	208.	.605
Interplane struts,	155.	.198	95.16	.122
Ailerons	71.4	1.01	33.19	.471
Lift, incidence and external wiring,	142.	.182	128.25	.164
Aileron control wires & turnbuckles and leads,	17.6	.0025	17.6	.0225
Total,	1314	1.682	851.20	1.088
Relative weights, : 154.5	100.			
: 100.	64.7			

The principles of design and the details of construction above described are fully covered by patent in the United States and in the principal European countries.

Bill H.R. 10717

A bill known as H.R. 10717, has been introduced into the House by Representative Clyde Kelly of Pennsylvania, for the purpose of encouraging commercial aviation and authorizing the Postmaster General to contract for air mail service. This bill, according to Vice President Bernard H. Mulvihill of the National Aeronautic Association of U.S.A. is the most forward looking piece of legislation proposed in connection with air mail service since the organization of that activity, for it does not hamper the Postmaster General by the inclusion of all manner of technical and semi-technical regulations, 'don'ts", 'can'ts" and restricting clauses retarding progress. Quite the opposite, this bill authorizes the Postmaster General to contract for the carrying of mail by air and leaves it to him to insure efficiency and economy of the whole project. In other words, the Postmaster General is made responsible for results, and will be held responsible by the Congress.

Congressman Kelly's bill provides "That the Postmaster General is authorized to contract with any individual, firm, or corporation for the transportation of mail by aircraft between such points and in accordance with such regulations as he may prescribe, at a rate not exceeding 1 mill per pound for each mile carried. The additional postage on matter to be carried by aircraft shall be 5 cents for each ounce or fraction thereof, to be prepaid by distinctive postage stamps affixed; Provided, That nothing herein shall be construed to prevent the Postmaster General from adding if necessary, sufficient first-class matter to make up a minimum load in accordance with the contract."

"By looking into the record of the air mail for the past fifteen months" continued Mr. Mulvihill, "one can readily see the wisdom of Congressman Kelly's bill, not only from the standpoint of absolute efficiency, on the part of the Post Office in the operation of air mail now authorized, but from a standpoint of extending the mail service as an economic measure in the commercial life of the nation.

"When we note that during the fiscal year of 1922, the air mail carried out 94-39/100 per cent of performance on 7,887 trans-continental trips between New York and San Francisco, 2,433 trips of which were through fog, rain, snow, and darkness; that 1,727,265 miles were covered, 1,224,723 lb. of mail carried and that 48,988,920 letters were advanced in delivery, there can be no question about the value of air mail, and when we further learn that for the last fifteen months of this work, entailing flights by twenty planes daily, rain or shine, has been carried on without a single fatality, we can appreciate the value of well regulated, well conducted aerial traffic.

"The National Aeronautic Association" Mr. Mulvihill said in conclusion, "stands squarely behind Congressman Kelly's bill, believing that it is one of the functions of any organization interested in the development of aeronautics in America, to endorse and assist in the enactment of such wise and well considered legislation. This particular bill is drafted giving freedom of action to the Postmaster General, yet safeguarding the public interests by limiting the contract price to be paid to a reasonable figure for all concerned."

New Naval Aircraft Instruments

The annual report of the Naval Observatory contains the following reference to new developments of aeronautical, navigational, and aerological instruments:

Two new types of aero compasses were tested in March. The Briggs-Heyl earth inductance compass was tried out in a DH4 plane at Anacostia and was later given a thorough test at the Naval Observatory shop and compass house. The Sperry gyro compass was tried out in an F5L plane and later tested at the naval air station at Anacostia. Unfortunately neither one of these compasses is yet properly developed for use in heavier-than-air machines. The Sperry gyro compass could be satisfactorily used in large airships of the ZR type.

The aerial sextant as designed by Lieutenant Commander Byrd is considered the best artificial horizon sextant that has been tried out. Five Navy Standard sextants fitted with the Fischer artificial horizon attachment have just been received from Keuffel & Esser Co., and it is believed that these instruments will be an improvement.

The British low-reading altimeter as manufactured by Short & Mason, of London, has proved successful and is the best low-reading altimeter that we now have for issue. A temperature-compensated high-reading altimeter was developed by the Bureau of Standards. Further experiments are necessary.

Altitude azimuth instruments for observing pilot balloons have been delivered to the Observatory from three sources: Keuffel & Esser Co., E. S. Ritchie & Sons, and the Washington Navy Yard. These three types of instruments are different, though intended for the same purpose. They are being tested by the aircraft tender Wright.

Pilot balloons, 6 and 9 in. and 7½ in., as manufactured by the United States and Faultless Rubber Co., respectively, have passed excellent tests and are now being issued to the service.

A plotting board designed by Keuffel & Esser Co. for plotting the positions of these pilot balloons in their ascensions is being tested at Anacostia.

A luminous-ground wind indicator, manufactured by the Air Transport Equipment Co., of Long Island, is being tested at Anacostia. This indicator is in use at McCook Field and at Hazelhurst Field.

The air stations and the U. S. S. Wright, Aroostook, and Langley have been fitted out with complete sets of aerological instruments. All 24-hr. drum aerological instruments have been changed to 7-day ones.

A chapter on aerial navigation for the new book on navigation that is to be used by midshipmen was compiled by the officer in charge of the aeronautic desk at the Naval Observatory.

A Transcontinental Attempt

The "Cloudster", a special biplane with a Liberty twelve, and built by Messrs. Davis and Springer in Los Angeles, Calif., is now at March Field, Riverside, Calif., preparing to hop off on a non-stop flight to the Atlantic Coast. The exact date of the attempt is not known, but the local papers report that it will be made during the next full moon.

It may be remembered that this ship was once before, a year or two ago, prepared for a transcontinental non-stop flight.

Excerpts from Annual Air Service Report

Value of Civil Aviation and Meteorology Emphasized in General Patrick's Report

In the present organization of the Army Air Service, due to greatly reduced enlisted strength and to the immediate necessity of maintaining observation units for training and operations with other arms, 38 per cent of the total strength is "air service" (observation aviation.) Offensive aviation has suffered accordingly and has been reduced to the minimum of one pursuit group, one attack group, and one bombardment group. The need for increased strength in this vitally important arm is readily apparent and it is urgently recommended that a sufficient increase of enlisted men be authorized for the Air Service to permit the organization of two additional bombardment groups, several balloon companies, of which there are none at present, additional airship companies, an increase in the size of the service schools, and the bringing up to strength of the large number of reduced strength units.

Value of Commercial Aviation

The growth and development of civil aviation constitutes an invaluable adjunct to military preparation in time of peace. The stimulation of competition resulting from an extensive use of aircraft for commercial purposes will insure the greatest progress in design and production and will at the same time serve to provide a manufacturing industry capable of meeting the increased demands of national defense in case of an emergency. No nation can afford to support, in time of peace, an air force capable of meeting the requirements of war, and because of the rapid deterioration of aeronautical equipment in storage the proposition to maintain a sufficient war reserve of aircraft is equally untenable. Three years is considered the maximum period during which planes may be kept in storage and still be relied upon as safe and sound for service use. The Air Service could draw upon this reserve for its current needs, but due to the limited size of the present Air Service the equipment used up each year in this manner would be a negligible fraction of the total, and it is thus apparent that such a scheme would necessitate the annual replacement of almost one-third of our total war reserve, with only a fraction having been used in service, the remainder of the third being lost through deterioration. The only solution lies in the quantity production, after hostilities become imminent, of the most highly perfected types our constant peace-time efforts have been able to produce.

Realizing, therefore, the importance, from a purely military point of view, of the development of a strong and well-organized commercial aviation in this country, the Air Service, although not specifically charged with this function, has undertaken to lend its assistance wherever possible to civil enterprises. While the tangible results have not been great, due to the very limited funds available for this work, at the same time the opportunities for extensive and important activity in this connection have become increasingly apparent. By encouraging the development of commerical aviation the Air Service is at the same time assisting in the development of the aircraft manufacturing industry, and the greater the progress of commercial aviation, likewise the greater will be the manufacturing facilities for the same, and these manufacturing facilities are, in themselves, what the Air Service must rely upon as a potential war reserve to augment any supply of planes set aside as a war reserve and which, of necessity, must be limited in number.

In an advisory capacity, the Air Service has endeavored in every way to promote the development of commercial aviation. Experiments have been undertaken to determine the value of aircraft and aerial photography in connection with farming, the development and the sale of real estate, and the planning of cities, towns, and parks.

Between the War and Navy Departments elimination of unnecessary duplication and the proper coordination in all undertakings involving joint action of the Army and Navy are obtained by means of the Joint Army and Navy Board and the Aeronautical Board.

The Aeronautical Board, as its name implies, is concerned solely with questions arising between the Air Service of the two departments. The Joint Army and Navy Board deals with the broader policies affecting the Army and Navy at large, and in this capacity frequently reviews the findings of the Aeronautical Board. Recommendations prepared by these boards are forwarded to the Secretary of War and the Secretary of the Navy for final action.

Importance of Meteorology

While it is evident that in time of peace, as well as in time of war, other branches of the Army will require meteorological data, it is nevertheless proved that under all circumstances the Air Service will make the greatest demands upon the agency charged with furnishing such data. It is likewise true that any meteorological service which will supply the Air Service must have sufficient data to furnish to other branches all that they can possibly require. At present the Signal Corps is charged with the Meteorological Service of the War Department. It is, however, so handicapped by lack of personnel and lack of funds that it can not furnish the Air Service, when it needs it and as it needs it, the necessary information concerning weather conditions along the routes which must be flown. As has been already stated, in order that this essential requirement of the Air Service may be met, there must be a sufficient number of meteorological stations along the airways operated by personnel in accordance with Air Service requirements, and there must be an efficient system by which weather reports may be transmitted from station to station just as they are needed. Unless the Signal Corps can be so equipped and so strengthened that it can undertake and carry on this vital duty effectively and satisfactorily, there is but one other possible solution, and that is the transfer to the Air Service of the Meteorological Service of the War Department, and giving to the Chief of Air Service the needed authority and the necessary funds to build up this service so that it will meet not only the vital needs of the Air Service itself, but will be enabled to supply to the other branches such meteorological data as they may require for their own operations.

The Air Service, in conjunction with the Department of Agriculture, has operated aerial patrols for the purpose of locating and reporting forest fires. This work was first undertaken in 1919, and although the appropriations for the purpose are not large, the activities have been extended. In 1922 approximately 112,000 square miles of territory were covered by patrols flying over air routes in the States of Washington, Oregon, and California.

Of 1,248 fires occurring in all the national forest preserves of California during the months of July, August and September, the aerial patrol reported 664, of which number it was the first to report 376. As a great saving in money and material loss is effected by the early determination of the existence and exact location of the fire, the airplane, through its speed and ability to cover otherwise almost inaccessible areas, has proven of inestimable value in this work.

In addition, Air Service material and personnel have been used in cooperation with the Department of Agriculture in spraying operations undertaken to determine the possibility in this way of checking the ravages of the gipsy moth and the boll weevil. The results obtained are very promising.

The Air Service Commissioned Personnel Problem

Legislation should be enacted at once to solve the problem of maintaining the Air Service as an organization properly balanced in its commissioned grades. The great majority of Air Service officers must be active fliers, and of them the

larger number must be young men between the ages, say, of 21 and 30. Of these flying officers there must be an adequate number of proper rank and properly trained to command the higher tactical organizations of the Air Service. In any well-balanced military organization the number of officers in the different grades must be properly proportioned. Under existing laws it is manifestly impossible to bring about this desirable state of affairs in the Air Service, due to the relatively large number of younger men who are required. One solution of this problem would be to provide for temporary commissions, or, better still, to authorize calling to active duty in the Air Service a number of younger reserve officers who might be retained while their flying ability is at a maximum and then revert to their reserve status. It is possible that a sufficient number of such young reserve officers might be found who would be willing to devote a few years to this duty. If it could likewise be arranged so that when their period of active duty is ended they could be given a status which would carry with it continuing pay on a proper basis, the probability of inducing a sufficient number to serve in this way would be greatly increased. There is still the problem of filling the commissioned ranks of the Air Service with its quota of permanent officers. I am strongly of the opinion that this filling must be done at the bottom, that is, the vacancies now existing should be filled by the appointment of second lieutenants. The source from which the best material can be obtained may be found in the Air Service Reserve units in the various institutions of learning where such are maintained. Authority should be granted by legislation or otherwise to call into active service the members of these units as they are graduated in order that they may be given flying training, and upon the completion of this training those who are regarded as suitable should be offered permanent commissions in the Army as Air Service officers. At present there are but six such Air Service Reserve units. A number of additional colleges and universities have asked to have such units established, and there is among their students a great desire for the training thus imparted. The act of Congress of June 30, 1922, prohibited the formation of more such units. This is regarded as most unfortunate, and legislation should be obtained which would permit additional Air Service units in a number of institutions.

It is likewise recommended that effort be made by the War Department to expedite legislation on bills introduced in both the House and the Senate, providing that not to exceed 10 per centum of the authorized commissioned strength of the Air Service in each grade, below that of brigadier general, shall be permitted to be nonflying officers. This will give to the Air Service a number of officers who, though perhaps unfit for flying, are of inestimable value to the Air Service in a nonflying capacity because of their special technical or administrative abilities.

Increased Appropriations for New Planes

In view of the rapid deterioration of war-produced equipment, in view of the inadequacy of appropriations for the replacement of war-produced equipment, and in view of the length of time involved in the delivery of new airplanes, it is recommended that a program for the production and purchase of new aircraft be considered and funds provided from year to year.

Conference on Air Law

During the last few weeks officials of the Aeronautical Chamber of Commerce, cooperating with the President of the National Aeronautic Association, have participated in conferences on the revised Wadsworth-Winslow Civil Aeronautics Act. The conferences have been held under Secretary Hoover's personal direction.

Airships Incorporated

The Airship Manufacturing Co. of America, at Hammondsport, N. Y., has now become "Airships Incorporated," with the following officers:—

Charles C. Witmer, president; Beckwith Havens, vice president; James F. Boyle, secretary and treasurer.

Canadian Airport Information

Our readers know from the information AVIATION publishes from time to time with regard to Canadian airports, or "airharbors" as our Northern neighbors call them, that the Dominion government exerts strict supervision over civil aeronautics. The Air Board at Ottawa is empowered, under the Canadian Air Navigation Act, to issue not only certificates to airplane and airship pilots, navigators, and ground engineers, and airworthiness certificates to aircraft, but also to issue licenses for airports.

A list of these certificates and licenses is published monthly by the Air Board. The information dealing with airports gives a remarkably complete picture of the location and resources of each station, and it has thus the merit of being of practical use to airmen instead of being merely notable for its statistical excellence.

The information is issued in two lists. The first, general list, only gives the location, license number, date of license, ground marking type and name of the airport, and appears in the following form:

Location.	*License No. Date of Issue, Ground Marking.*	*Type.*	*Licensee.*
Sault Ste. Marie, Ont.			
St. Mary's River near Imperial Oil Co's., Dock.	18 7/6/20 MK. 28.	Commercial seaplane Station. over 800 yd.	Spanish River Pulp & Paper Mills, Ltd., Sault Ste. Marie, Ont.

The second list gives a detailed description of the airport. The excellence of the information is so marked that it might well serve as a model for the classifying of airports in the United States.

There follow several typical descriptions of Canadian airports.

LICENSE NO. 16—ISSUED 2-6-20.

Lac a la Tortue, P. Q. Commercial Seaplane Station. Situated ¼ mile east of Lac a la Tortue and 3 miles S. E. of Grand Mere, P. Q. Latitude 46°36′: Longitude 72°40′. Altitude 430 ft.. above sea level. Local magnetic variation 18°2′ W. of N. Maximum dimensions for landing—over 800 yd. Licensed for use by day only and marked with an equilateral triangle each side of which is 3′ wide and 25′ long (inside measurement), thus: (See Diagram of Markings, Ref. No. 28).

Directional wind indicator on hangar. Telephone number 109 ring 31. Water and fuel supply. Facilities for minor repairs. Hangar accommodation. Handling party station at airharbor. Available communication—good roads (sand), taxis to village.

Licensee—Laurentide Co., Ltd., Grand 'Mere, P. Q.

LICENSE NO. 27—ISSUED 19-7-20.

Camp Borden, Ont. Airharbor (military and civil), Government. Situated 4 miles S. W. of Angus, Ont. and 15 miles S. W. of Barrie, Ont. Latitude 44°17′; longitude 79°56′. Altitude 627′ above sea level. Local magnetic variation 6° W. of N. Maximum dimensions for landing —1 mile by 2 miles. Licensed for use by day only and marked with an equilateral triangle each side of which is 3′ wide and 25′ long (inside measurement) thus: (See Diagram of Markings, Ref. No. 28).

Directional wind indicators attached on 6th and 12th hangars from the north. Telephone—Barrie 435. Facilities for repairs. Water and fuel supply. Machine accommodation and a handling party stationed on the aerodrome. Available communication to Angus, Ont.,—motor cars can be obtained by telephone. Good roads for two miles—remaining distance sand road.

Licensee—The Air Board, Ottawa, Ont.

LICENSE NO. 5—ISSUED 7-5-20.

Edmonton, Alberta. Commercial Airharbor. Situated on St. Albert trail 3½ miles N. W. of Edmonton P. O. Latitude 53°35′; longitude 113°33′. Altitude 2215 ft. above sea level. Local magnetic variation 27°0′ E. of N. Maximum dimensions for landing—under 300 yd. Licensed for use by day only and marked with a triangle divided by a cross into four approximately equal parts, thus: (See Diagram of Markings, Ref. No. 24).

Directional wind indicator on hangar. Telegraph and telegraphic address—May-Gorman Aeroplanes Ltd., 10327 99th Ave., Edmonton, Alta. Telephone connection. Water and fuel supply. Facilities for minor repairs only. Hangar accommodation. Available communication to City of Edmonton—motor transport, electric railway ½ mile S. E. of aerodrome, good roads.

Licensee—May-Gorman Aeroplanes Ltd., 10327-99th Ave., Edmonton, Alberta.

LICENSE NO. 10—ISSUED 17-5-20.

Armour Heights, Ont. (Near Toronto); Customs Airharbor. (Lat. 43°43′ N. Long. 79°24′ W.) about 1½ miles north west of Stop 26. Metropolitan Railway, York Township, Ontario. Alt. 540 ft. above sea level. Dimensions, 400 yd. in circular diameter. Licensed for use by day only and marked with a square and circle inserted divided in equal parts by a vertical line thus: (See Diagram Markings Ref. No. 21).

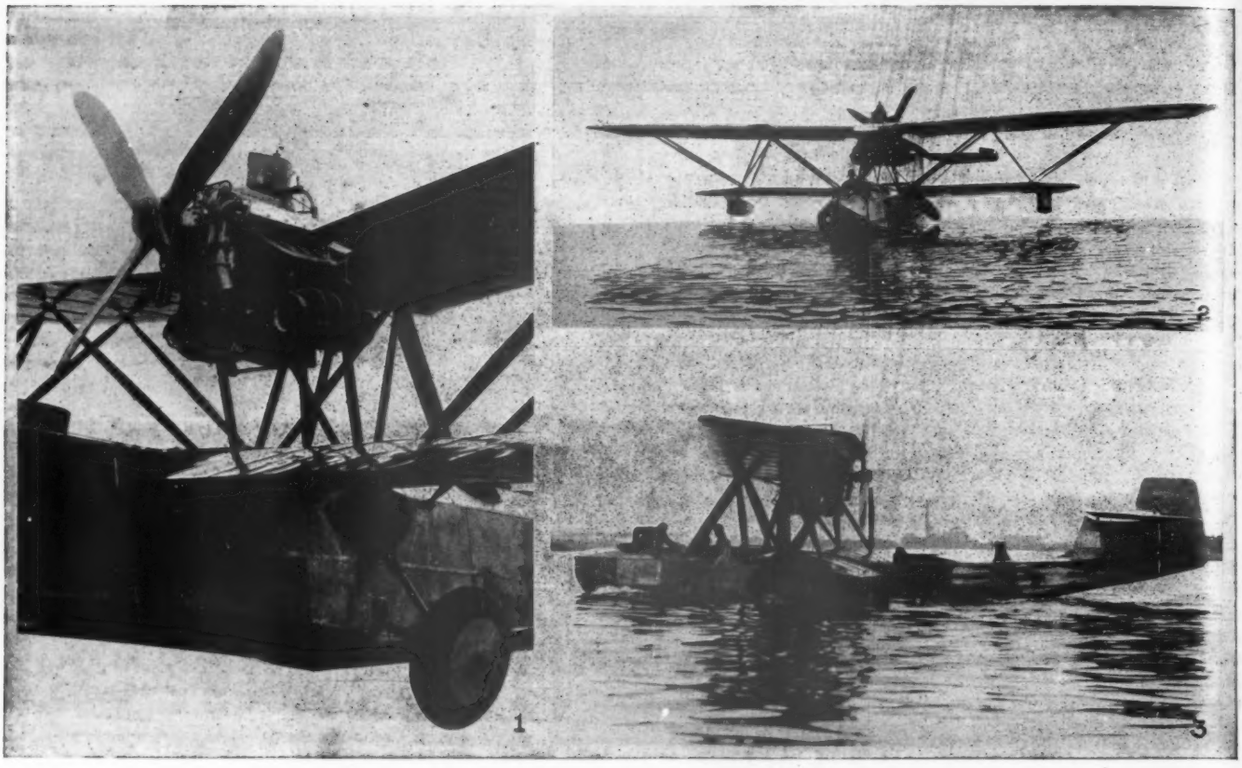
Customs personnel on duty only when notified at Toronto Customs House. Directional wind indicator in North Eastern Corner. Telephone connection and water supply. There are facilities for repair, fuel supply and machine accommodation and a handling party stationed on the aerodrome.

Available communication to City—Electric Railway 1 mile from Aerodrome. Good roads.

Licensee—Bishop-Barker Aeroplanes Limited, 93 Spadina Ave., Toronto, Ontario.

The Fokker Amphibian Flying Boat

All Metal Boat, Wooden Wings and Warren Truss Chief Characteristics of New Ship



The Fokker amphibian flying boat. Fig. 1—Close-up of engine mounting. Fig. 2—Front view. Fig. 3—Side view

During the fall of 1922, the Fokker factory at Amsterdam produced a new type of amphibian flying boat, which shows many interesting features and is characterized by excellent flying qualities.

Primarily designed for naval observation purposes, especially in the Dutch Colonies, the Fokker amphibian is, however, adaptable to many commercial purposes, a number of the constructional features making especially for economical operation.

The Boat

The boat is entirely constructed in duralumin and has proved to have very favorable lines for a quick get-away. The type of construction used is very simple and much more easily repaired than is usually the case with metal constructions. Great strength fore and aft is obtained throughout the boat by continuing the keel upward in the form of a central girder up to the deck of the boat. There are eleven watertight compartments, which are formed partly by the central girder and partly by the bulkheads. The closed sections are accessible through manholes. The bottom of the boat has two open steps.

The seating arrangements in the naval type are as follows: In the bow is the observer's cockpit with emergency controls. The seat and the controls can be folded away when not in use, when it is desired to use the gun ring. Through a passage on the starboard side of the boat, access is obtained to the mechanic's cockpit, which is to the right of the pilot. The pilot's complete controls, with the seat, are mounted on a detachable frame forming one unit. The mechanic's seat can be folded up and it is then possible to pass through to the next compartment, which provides complete accessibilty at all times to the collapsible undercarriage.

The shock absorbers and entire lowering and raising mechanism can in this way be reached even during flight and adjusted if necessary.

The undercarriage is very simple and consists of short axles and radius rods hinged to the boat, with compression struts which run diagonally upward from the wheels into the boat. These latter telescope for raising and lowering the wheels. The raising crank can be actuated by the pilot, or by the mechanic or even by the observer in the bow. The lowering of the wheels is instantaneous and automatic, but the pilot has also a pedal with which the locking wedges can be further positively locked after the wheels have been lowered.

The gasoline tanks, which are in the next compartment aft of the landing gear, have a capacity of 120 gal.

Further aft is a second observers cockpit, which brings the normal number of crew up to four.

An extremely strong, steerable combined tail skid and water rudder is attached to the rear step.

The Wings

The good flying qualities of the Fokker amphibian are particularly due to the special arrangement of the wing panels. The upper plane, built in two parts entirely from wood and veneer covered, is considerably swept back and attached to a steel tube strut pyramid on the boat. The bottom plane, which is in one piece and also constructed entirely of wood, lies in a considerably staggered position with respect to the top plane, and directly on the boat; it is not back swept but has a slight dihedral. The wing bracing is by struts only, in the form of a modified Warren girder. The wing tip pontoons are made from duralumin and suspended on shock absorbers. If desired for special purposes, the wings can also be constructed entirely of metal.

The tail unit is very simple in construction, consisting of a thick cantilever fin with rudder and a tail plane with elevator. The tail plane incidence is adjustable from the pilot's seat, the adjusting mechanism being carried inside the fin. The entire construction of the tail surfaces is in steel tube fabric covered.

The engine is mounted with the radiators and the oil tank as a unit, as in the latest Fokker commercial planes. This unit, consisting of engine radiators, water connections and tank, oil tank and oil connections and exhaust stacks, is connected to the engine bed only by four bolts and can be hoisted away from above without dismantling any parts of the plane; the engine bearers are provided with permanent feet so that the entire unit can be set on the ground without damage to the radiators, crank cases, pumps, etc.

The engine fitted at present is a 450 hp. Napier Lion, but owing to the arrangement of the wings and the engine bed it is possible to fit practically any other engine, such as the Liberty, with very little alteration and without affecting the balance.

LEADING DIMENSIONS AND WEIGHTS

Span, upper plane, 59 ft. 9 in.
Span, lower plane, 34 ft. 6 in.
Chord, upper plane, 7 ft. 10 in.
Chord, lower plane, 5 ft. 10 in.
Length overall, 39 ft. 5 in.
Height, 10 ft. 9 in.
Weight empty, 4000 lb.
Weight loaded, 5760 lb.
Gasoline capacity, 120 gal.
Speed, 120 m.p.h.
Take-off (fully loaded), 20 sec.

New Caproni Airplanes

The Caproni company of Milan, Italy, which during the late war specialized in the construction of large three-engined bombers, large number of which were used by the Italian air force, and, to some extent also by the French air force, recently produced a modernized version of the Caproni type 600.

The new airplane, known as type 1922, is greatly refined with respect to previous models. The construction has been simplified by the suppression of many struts and wires both in the wing cells and in the undercarriage, and the central nacelle and the two fuselages are better streamlined. As a result a much better performing ship has been obtained, all other things being equal.

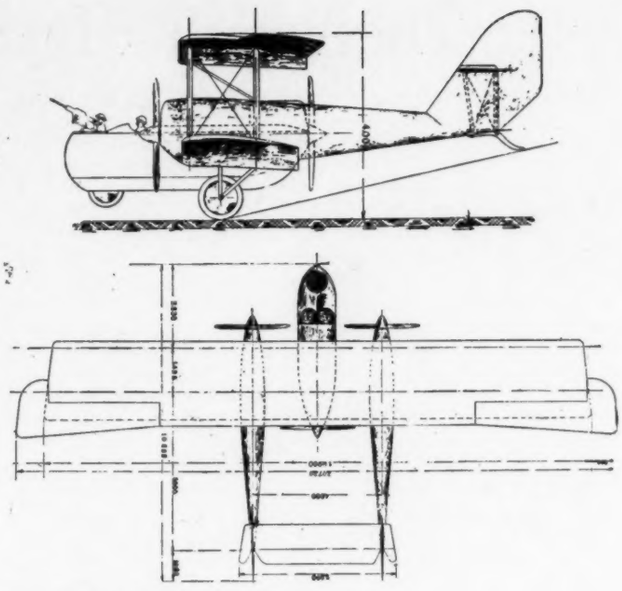
The bracing of the central portion of the wing cells is entirely insured by rigid struts, bracing wires being only used in the outer portions of the wings. The fuselages are built in two pieces and hinged to one another so that the machine can more easily be crated for shipping by rail. For this purpose the overall dimensions have also been greatly reduced.

As in the older models, the fuselages carry in their nose each a tractor engine, and a third engine, driving a pusher propeller is mounted in the central nacelle. The latter accomodates a crew of three, namely a pilot and an alternate side by side, and a gunner forward. The nacelle is of fairly large size is provided on this machine in order that all the bombs may be carried inside instead of them being carried under the wings, as was the case in the older models.

Perhaps the most noticeable departure from the original design is found in the tail unit, only two rudders being fitted instead of three. The tail plane and elevator are of biplane form. Ailerons, of the compensated type, are carried on the top wings only.

Two of the three engines (which may be either 180 hp. Isotta-Fraschini B4V or 200 hp. SPA models) are sufficient to maintain the machine in horizontal flight. The two tractor propellers are two-bladed, while the pusher propeller is four-bladed, all three having a diameter of 2.50 meters and turning at 1500 r.p.m.

The landing gear consists of two chain wheels of one meter diameter, which are rubber sprung in a V type chassis. An emergency wheel is provided under the nose of the nacelle. Following are the characteristics of this machine:



From *Ala d'Italia*

Outline drawings of the Caproni Model 1922 Bomber

CHARACTERISTICS OF THE CAPRONI MODEL 1922 BOMBER

Span, upper wings, 20.72 meters.
Span, lower wings, 19.00 meters.
Overall length, 10.80 meters.
Maximum height, 4.20 meters.
Chord, upper wings, 2.90 meters.
Chord, lower wings, 2.65 meters.
Gap, 2.30 meters.
Total wing area, 100 sq. meters.
Area, tailplane, 7.15 sq. meters.
Area, elevators, 3.60 sq. meters.
Total horsepower, 540-600.
Weight of engine group, 1020 kg.
Net weight of machine, 2300 kg.
Useful load, 1700 kg.
Gross weight, 4000 kg.
Maximum speed, 160-170 km.p.h.
Endurance, 4 hr.

In addition to this new bomber, the Caproni company recently produced a single-engined fighting triplane, the skeleton of which is entirely built of steel tubing. This ship is somewhat reminiscent of the Curtiss 18T triplane, except that rigid struts inclined from the bottom wing outward take the place of flying wires. The wings and tailplane are raked in the well known Morane-Saulnier fashion, which would make this ship easy to identify. The crew consists of a pilot and a gunner.

CHARACTERISTICS OF THE CAPRONI FIGHTING TRIPLANE

Span (equal), 13.25 meters.
Overall length, 9.05 meters.
Maximum height, 4.20 meters.
Total wing area, 58.50 sq. meters.
Engine, type, Fiat A12bis.
Horsepower, 300.
Net weight of machine, 850 kg.
Gross weight, 1550 kg.
Maximum speed, 180-200 km.p.h.
Safety factor, 10.

The Sampaio Correia II

The H16 flying boat Sampaio Correia II, which was forced to land with a broken timing gear in Formoza Bay, 46 miles from Natal, remained there from Dec. 22 to Dec. 27. During her stay she was equipped with new timing gears which had been shipped to Recife (Pernambuco), and on Dec. 27 the boat managed to fly the 45 miles to Cabedello, the outer harbor of Parahyba, in 48 min. As a heavy sea was running in Formoza Bay, which caused some damage to the wings, the crew was reduced to Pilot Hinton and Mechanic Wilshusen on the trip to Cabedello.

On Dec. 28 the Sampaio Correia II left Cabadello bound for Recife, a distance of 100 miles. Shortly after the take-off one of the new timing gears broke and she had to land to await repairs.

The Weather Bureau and Aviation

Annual Report Details Forecast Work in Aid Of Aviation and Aerological Investigations

The annual report of C. F. Marvin, Chief of the Weather Bureau, contains the following reference to forecast work in aid of aviation and aerological investigations:

Forecasts in aid of aviation—The activities in the aid of aviation materially increased during the year. Daily forecasts covering fourteen zones into which the country is divided were issued regularly and furnished to Army, Navy, and Post Office officials and to the flying fields. In addition, arrangements were made during the year for broadcasting upper-air forecasts for all the zones, except two, from naval radio stations.

Separate and more detailed forecasts were begun in January, 1922, at the request of the Air Service of the Army for the three air routes from Washington to Norfolk, Va., to Long Island, N. Y., and to Dayton, Ohio. They are issued twice daily and contain advices as to weather conditions to be encountered from the surface up to 5000 ft. These forecasts also are published in morning newspapers in Washington and in Dayton. The requests for special forecasts and weather information from individual aviators before beginning flights have largely increased. This latter information for the most part is supplied by the forecasters by telephone directly to the fliers.

Cooperation with Air Service

Important and extensive cooperative arrangements between the Air Service and the Weather Bureau were established during the year for the purpose of bringing the aviators of the former service and Weather Bureau officials in the field into closer contact to the end that forecasts, warnings, and weather information may be made of the greatest possible benefit to Army aviators. This plan involves the visits by Air Service aviators to the field stations of the Weather Bureau for the purpose of personal acquaintanceship, the discussion of weather conditions peculiar to the various sections of the country over which flights are made, the acquiring of knowledge of the facilities at each station, for the furnishing of forecasts and information desired by aviators, and the perfecting of details for the securing of such information promptly and whenever required.

The Weather Bureau collects at its field stations twice-daily observations of weather from all parts of the country at 8 a. m. and 8 p. m., seventy-fifth meridian time. Each of the Air Service fields calls the nearest Weather Bureau station by telephone every morning and evening when flying operations are being carried out for the purpose of obtaining the weather forecasts and reports. Fliers when away from their stations are authorized to telegraph or telephone any Weather Bureau station at any time for information as to prevailing and expected weather conditions in a particular section and to receive a prepaid reply. This feature of the service is designed to enable fliers who for any reason are forced to land at other than regular flying fields to secure all possible information which will enable them to avoid danger in returning to their home stations or in reaching their destinations.

Knowledge of the science of meteorology is an important adjunct to expert flying and a part of the cooperation between the two services includes the delivery of lectures by meteorologists of the Weather Bureau to Air Service aviators on the general work of the weather service, the climatology of various sections of the country, air currents, the physics of the air, and on other meteorological subjects pertinent to aviation. Already a number of these lectures have been delivered and plans are being developed for a material extension of this work.

Circulars announcing the details of the cooperation were issued to all field stations of the two services, in which the Chief of the Air Service enjoined that the matter is "of most vital importance at the present time in connection with cross-country flying and it is desired that every effort be made to carry out the provisions as outlined."

A similar cooperation exists with the aerological section of the Navy Department. Forecasts and weather reports are furnished with all possible completeness and dispatch to naval bases at which flying operations are conducted. A representative of that service is given desk space and facilities in the forecast room of the Weather Bureau at Washington, where he prepares each morning a weather map synchronously with the charts used for the issuing of the official forecasts of the Weather Bureau. These official forecasts and weather reports are telephoned by him directly from the Weather Bureau office to the naval bases. In this manner the information and advices are transmitted with the least possible delay and with effective results.

Service was rendered for a number of special airplane flights during the year by furnishing detailed forecasts and extra observations at frequent intervals along the route to be followed. One instance of this kind was the journey of a squadron of twelve seaplanes, much of it over land, from Norfolk, Va., to Pensacola, Fla., by way of the Atlantic coast line to Fernandina, Fla., thence overland across the Florida Peninsula to Cedar Keys and from that point to Pensacola. This journey was undertaken in July, and the various steps in the trips were made in accordance with the forecasts and advices furnished by the Weather Bureau. A seaplane can not land with safety on terra firma, and it was of the utmost importance, both to the success of the undertaking and in safeguarding the lives of the aviators, that no unfavorable weather conditions be encountered especially for the long overland jump from Fernandina to Cedar Keys. The trip was accomplished without a serious mishap and the commander of the squadron in acknowledging the assistance rendered by the forecaster of the Weather Bureau wrote as follows:

"The commander of air squadrons desires to express his appreciation of the excellent cooperation of the Weather Bureau, both of Washington and Jacksonville, in furnishing weather reports to the air squadrons for the recent flight of twelve F5L seaplanes across Florida. The safety of the passage undoubtedly was made more certain thereby, as on the receipt of adverse weather reports the passage of seven planes was delayed two days, during which severe thunderstorms and rain squalls would have been encountered."

Aerological Investigations

Kite stations—Observations with kites were made regularly at Broken Arrow, Okla.; Drexel, Nebr.; Due West, S. C.; Ellendale, N. Dak.; Grosbeck, Tex.; and Royal Center, Ind. Kite flights are made daily, whenever possible, and, in addition when conditions are favorable, continuous series of flights are made for periods of 24 to 36 hr. Records of air pressure, temperature, humidity, and wind are thus obtained.

Pilot-balloon stations—Observations by means of pilot balloons were made at the six kite stations, above listed, and at Burlington, Vt.; Denver, Colo.; Ithaca, N. Y.; Key West, Fla.; Lansing, Mich.; Madison, Wis.; San Francisco, Calif.; San Juan, P. R.; and Washington, D. C. The observations are made twice daily at the six kite stations and at Key West, Fla., and Washington, D. C., and once each day at the remaining stations, and the computed wind conditions at various heights are telegraphed to district forecast centers at Washington, D. C., Chicago, Ill., and San Francisco, Calif., where they form the basis for "Flying Weather" forecasts issued to the military, naval and postal aviation services.

Special observations have been made, when requested, for use in connection with long-distance flights, free-balloon races, etc.

Observations with two theodolites have been continued, whenever opportunity afforded, in order to check the accuracy of the formula for rate of ascent of balloons and the behavior

of the balloons themselves at high altitudes. These observations have shown that the revised rate of ascent formula gives extremely reliable results, except when there are pronounced vertical movements in the atmosphere. Even then the error is appreciable only in the lower layers.

Cooperation—Effective cooperation with the Army and Navy meteorological services has been continued throughout the year. Each of these services maintains a number of pilot-balloon stations, whose primary purpose is to furnish data of immediate local interest to aviators at flying fields. These observations are also telegraphed to district forecast centers of the Weather Bureau for use in issuing "Flying Weather" forecasts. They thus supplement, in a very helpful way, the observations made at Weather Bureau aerological stations. In addition to the stations in the United States proper, the Navy maintains one at Santo Domingo, Dominican Republic, and one at Coco Solo, Canal Zone, which, together with those of the Weather Bureau at San Juan, P. R., and Key West, Fla., furnish information of value in connection with the development and movement of hurricanes. A much larger number of stations is necessary, however, to make this service as effective as it should be.

In the autumn of 1921, at the request of the director of the Brazilian meteorological service and in cooperation with a representative of that service, temporarily stationed in Washington, plans for the organization of an aerological service in Brazil, patterned after that in the United States, were outlined and satisfactorily worked out. All necessary equipment was purchased, methods used in this country were studied and adopted, and two trained observers of the Weather Bureau were released, in order that they might be employed by the Brazilian Government to get the service properly inaugurated in that country.

Central office—All observations made at kite and balloon stations, by the Army and Navy as well as by the Weather Bureau, are forwarded to the central office of the Weather Bureau for final reduction and study. Data based upon these observations are furnished in answer to numerous inquiries not only from other government departments, but from commercial aviation concerns as well. In many cases reprints of special discussions and summaries were issued in answer to these requests.

Work has been continued on the preparation of a summary entitled, "An Aerological Survey of the United States." When completed, this will contain the results of all free-air observations made in this country. Part 1, "Results of Observations by Means of Kites," was completed and published during the past year. It contains tables and figures showing monthly, seasonal, and annual values of pressure, temperature, humidity, density, and wind at various heights up to 5 kilometers. It also includes a detailed study of the behavior of free-air winds, classified by months and seasons, by geographic location and according to different wind directions at the surface. Tables and figures are given, showing the frequency and amount of clockwise and counterclockwise turning of winds, the frequency of winds from different directions, the average and extreme velocities encountered, and other data of special interest and value to aviators. This "survey" is confined to those portions of the country east of the Rocky Mountains, since free-air observations farther west are too few for the purpose. Additional stations in the West and a few more in the East than we now have are urgently needed, in order to give complete information for all parts of the country.

At the request of the National Advisory Committee for Aeronautics the preparation of a report on "Standard atmosphere" was undertaken and completed. It has been published by that committee as Report No. 147 and will later be included in the annual report. In it are discussed the need of a standard set of values of pressure, temperature, and density at various altitudes, and the desirability of adopting such values as are most in accord with actual average conditions in order that corrections in individual cases may be as small as possible. To meet this need, as far as the United States is concerned, all free-air observations obtained by means of kites and sounding balloons at several stations in this country near latitude 40 deg. north have been used, and average values of pressure, temperature, and density, based upon these observations, have been determined for summer, winter, and the year, and for all altitudes up to 20,000 meters (65,000 ft.). These values have been adopted by the National Advisory Committee for Aeronautics for use as "standard" in this country.

American Legion Aeronautic Committee

The American Legion is taking an active interest in aviation through a Committee on Aeronautics headed by Maj. Reed G. Landis, which has just been appointed.

This committee is made up of flying men who are firmly impressed with the necessity of the development of aviation both military and commercial. It is earnestly endeavoring to formulate an intelligent aviation policy for the Legion, and it will energetically attempt to put the program into effect after it has been formulated.

The Committee is very anxious to receive fundamental suggestions in order that it may not overlook any important elements. The question now before the Legion is *what should be done now?*

Constructive suggestions are invited and should be addressed to Reed G. Landis, 337 West Madison Street, Chicago.

At the Annual Convention of the American Legion held in New Orleans, Oct. 19, 1922, the following resolution was adopted:

"Whereas, the American Legion is an American organization pledged to Americanism and to the development and support of all ideas and movements for the future peace, prosperity and welfare of our country, and

"Whereas, it has in it's local Posts, and County, State and National organizations, a powerful machinery, which can be put into operation with successful effect, in support of any movement of vital interest to the United States, and

"Whereas, Aeronautics is a subject of vital interest to the United States, for the purpose of National defense and the development and commercial aviation in order that our country may keep pace with the strides made by other nations in this direction, be it

"Resolved, that an American Legion Committee on Aeronautics be established, whose functions it shall be to so cooperate with the U. S. Army Air Service and other nationally recognized institutions and organizations devoted to the interests of Aeronautics; and through the medium of our local posts, county and state organizations and national organization, to arouse the interest of the people in the development of commercial aviation, at such times and places as conditions and circumstances may warrant, and be it further

"Resolved, that said Committee on Aeronautics shall consist of five members and be appointed annually by the National Commander, and they shall serve without pay or expense."

Loening to Study European Airways

Grover Loening, the airplane constructor who built the Air Yachts used last summer around New York City and Newport by Harold S. Vanderbilt, Vincent Astor and others, recently sailed for Europe.

In connection with projects now being studied for air lines next summer from New York to Newport, Southampton and other nearby resorts, Mr. Loening will make an investigation of the organization and equipment used on several European air lines, studying the French, English and German methods and their latest developments. While in Paris, Mr. Loening will represent the Aeronautical Chamber of Commerce of the United States at the Annual Aeronautic Salon which is held at the Grand Palais, and at which are gathered aviation experts from all over the world.

During his trip he will lecture on various phases of American aviation, which has now achieved a recognized leading place.

The Air Service in the National Guard

Report of the Chief of Militia Bureau

The report of the Chief of the Militia Bureau for the fiscal year ending June 30, 1922 contains a statement of the present air service units of the National Guard. The following comments indicate the attitude of the Militia Bureau toward the air organizations of the various states.

Organization

The organization of the Air Service of the National Guard has been beset with many difficulties. The fact that it is hard for the average National Guard man to devote daylight hours to his training and the further fact that a member of the National Guard can not secure a military pilot's rating except by attending a year's course at the Regular Army Air Service Training School at Brooks Field, have combined to hold back the development of this branch in the National Guard. As indicated in the next section, an improvement may soon be made by the establishment of a shorter course of training.

An additional handicap has now been imposed by the inadequate appropriations made for the guard in the fiscal year 1923, which make it necessary to withhold authority for the organization of such units save under the most favorable circumstances.

The 26th, 27th, 29th, and 34th Divisions have their observation squadrons organized in Boston, Mass., New York City, Baltimore, Md., and St. Paul, Minn. In addition to these four units a corps observation squadron has been formed in each of the following cities: Birmingham, Ala., Kokomo, Ind., and Nashville, Tenn.

The total enrolled in this service on the date of this report was 136 officers and 643 enlisted men, the individual enrollments being:

Unit.	*Officers.*	*Enlisted men.*
101st Observation Squadron	18	69
102nd Observation Squadron and Photo Section	18	88
104th Observation Squadron	20	86
109th Observation Squadron and Photo Section	20	101
136th Observation Squadron	12	101
137th Observation Squadron	24	111
135th Observation Squadron	24	87
Total	136	643

The Militia Bureau believes that the present law is deficient in that no provision is made for the compensation of National Guard pilots during such periods as they may be incapacitated for work as a result of flying accidents. Unless some provision can be made for such cases, the flying personnel of the National Guard will labor under the handicap of being restricted to young men of sufficient means to justify their taking the risk of such service.

In spite of the training precautions taken the Militia Bureau reports with deep regret the death of one of the most capable of the guard's pilots—Maj. Wilber M. Fagley, of the 137th Squadron. An officer of the 104th Observation Squadron (Maryland) was also killed in a flying accident just before the recognition of that unit last summer.

Training

The Militia Bureau is temporarily handicapped by the lack of an Air Service officer for duty in the bureau, but it is hoped that this situation will be corrected very shortly. In the absence of a supervisor to direct training of National Guard Air Service units, no attempt will be made in this report to discuss the technical details of that training. However, it may be said that the Militia Bureau and the Regular Army Air Service are in accord as to the scope of the training to be given units of that branch in the National Guard.

It is the opinion of the Chief of Air Service that such units should ordinarily be expected to carry on both organizational training and individual training for officers and enlisted men. The individual training is conducted by means of lectures, shop and field work, and should, in addition to military training, embrace the following subjects:

Motors:
- (*a*) Nomenclature.
- (*b*) Theory of operation.
- (*c*) Assembly and repair of service type motors.
- (*d*) Servicing motors in the field.

Airplanes:
- (*a*) Theory of flight.
- (*b*) Nomenclature.
- (*c*) Fabric and dopes.
- (*d*) Assembly, rigging, and repair.
- (*e*) Servicing an airplane.

Machine guns:
- (*a*) Nomenclature.
- (*b*) Assembly and repair.
- (*c*) Range practice.

Aerial photography:
- (*a*) Cameras and mounts.
- (*b*) Development and printing.
- (*c*) Mosaic map making.
- (*d*) Types and uses of aerial photography.

Aerial photography—Continued.
- (*e*) Interpretation of aerial photographs.

Communications:
- (*a*) Theory and circuits.
- (*b*) Operation and repair of service type sets.
- (*c*) Installation of service type sets in airplanes.

Observation aviation.
Airplane instruments.
Topography and map reading.
Bombardment aviation.
Pursuit aviation.
Attack aviation.
Navigation and meteorology.
Aerial tactics.
Air Service organization, administration and supply.
Pistol range.
Rifle range.

Organizational training, aside from that given during the annual summer encampments, should include various flight missions. These may be for visual reconnaissance, map reading, map making, radio and panel missions, bombardment, aerial photography, and formation flying for officers. The necessary drills and formations for training the entire personnel should of course be included.

Both the Militia Bureau and those in charge of the Regular Army Air Service believe that the individual and organizational training may very well be supplemented by correspondence courses in Air Service subjects. It is planned to inaugurate such a course about Oct. 1 next.

Equipment

Nine airplanes are authorized for each National Guard squadron. Normally half of the ships would be replaced each year, since two years is the average period of serviceability for the two-seater type issued—the Curtiss JN6H. A total of 53 airplanes had been issued to six squadrons by June 30. The 101st Squadron not being provided with proper hangar space, has not yet been supplied with its flying equipment. Due to accidents, a total of 13 machines were issued to the 104th Squadron at Baltimore.

Satisfactory hangar accommodations and ample storage space are required for units of the National Guard Air Service before recognition can be extended to them and before flying equipment can be issued. Upon the condition of the equipment depends the safety of the flying personnel, and it is the policy of the Militia Bureau and of the Regular Army Air Service to hold to high standards in this matter. The United States furnishes all-steel hangars if desired, but the States must find the money for their erection and maintenance.

Reasonably permanent hangars, preferably of steel, are required, and they must be provided with concrete floors, electric lights, and heating and water systems. Workshops, garages, and office and storage buildings must be of a permanent character, suitably floored, heated, and lighted. Adequate fire protection must be provided. Underground gasoline tank, oil tank, wind-direction cone, and field markers are also required.

The necessity for armories of such construction that they can be heated was emphasized during the past winter by an experience with one of the National Guard observation squadrons. Nine airplanes were issued to the unit, and these were housed in Bessoneau hangars—i. e., the canvas-covered type. Cold weather forced the organization to suspend operations. The freezing temperature made three of the airplanes total wrecks.

The shortage in the appropriations for the present year will not necessarily prevent the Federal recognition of additional Air Service units in the National Guard, but in view of the inevitable hazards connected with such service, the Militia Bureau will consider recognizing only those units that are amply provided for by the States presenting them.

New Aeromarine Boat Christened

The christening ceremony of the latest flying boat of the Aeromarine Airways, Inc., which has been specially detailed for the Miami-Nassau air service, was performed recently when Maj. Sir Harry Edward Spiller Cordeaux, Governor of the Bahamas, formally gave his name to the craft in Nassau Harbor. Governor Cordeaux broke a bottle of champagne over the bow of the craft with the words, "I name this flying boat the 'Cordeaux' and trust that under the guiding hand of Providence she may make many successful trips."

Thousands of people watched the ceremony. A Guard of Honor from the Bahama Police under the Acting Commandant, C. J. Whebell, was drawn up opposite to the landing and the Band played the Royal Salute on the arrival of the Governor, who was accompanied by Lady Cordeaux, Roland Rohlfs, Manager of the Miami Division of the Aeromarine Airways, the Hon. H. E. W. Grant, C.M.G., Colonial Secretary, the Hon. P. W. D. Armbrister, Receiver General and Treasurer, the Hons. Sir Jas. P. Sands, G. H. Gamblin, G. H. Johnson, J. R. G. Young, Members of the Executive Council, the Hon. Harcourt Malcolm, C.B.E., K. C., Speaker of the House of Assembly, the Hon. Lorin Lathrop, American Consul and Mrs. Lathrop, Kenneth Solomon, Chairman of the Development Boards, Miss Moseley, Editor of the Nassau Guardian, Mrs. Boyce, wife of the American Vice Consul, and Sidney Farrington, late Royal Air Force, and local agent for the Aeromarine Co.

In a spech after the ceremony, Governor Cordeaux expressed what great pleasure it had given him to accept the invitation of the Aeromarine Airways to perform the naming ceremony of their latest and most-up-to-date aircraft. It was always a pleasure for him to lend his aid to any enterprise which would benefit the Colony. Few among them would have any doubt that the institution of a regular air service between Nassau and Miami would greatly facilitate relations with their friends and neighbors across the Gulf Stream. He would not care to be associated with any enterprise which was not entirely sound and reliable but in this instance he had not the slightest hesitation in accepting the compliment which the Aeromarine Airways had paid him by suggesting that their craft should bear his name.

As a proof of his confidence in the company, the Governor accepted an invitation to go for a flight and with other members of his party made an inspection trip of Nassau from the air. At its conclusion the Band played the "Star Spangled Banner," three cheers being given for the Governor at the instance of the American Consul.

Aerial Mails Buenos Aires to Montevideo

By arrangement with the River Plate Aviation Co. the Argentine Post Office has established an air mail service between Buenos Aires and Montevideo. Three seaplanes will be used, and a daily service maintained, the flying time being about one hour. The planes will carry passengers as well as mail.

In addition to the regular postal rates for mails and newspapers there will be a surtax of 30 centavos for each 20 grams or fraction thereof. For printed matter the surtax will be 30 centavos for each 65 grams. One of the seaplanes to be used is already on hand and the service should be in operation before the end of the year, *Commerce Reports* states under Dec. 4, last.

The Speed of Birds

A study of how fast certain birds fly has been made by the Biological Survey of the Department of Agriculture. Certain kinds of hawks have a speed of 200 ft. a second or about 136 m.p.h. The canvasback duck can fly from 60 to 70 m.p.h. The crow is the slowest of the birds studied as it only travels at 30 m.p.h. The common dove can reach a speed of 68 m.p.h., but it usually travels much slower. Many of the northern ducks can fly at a speed of 68 to 98 m.p.h. but generally fly at a slower rate of speed.

Aeronautical Meeting in Philadelphia

At a joint meeting held Dec. 19 of the Engineers Club and the Aero Club of Pennsylvania, at Philadelphia, a movement was launched to make Philadelphia one of the greatest airports in the United States. The subjects under discussion at the meeting were "Air Terminals" and "The Model Airway." Archibald Black of Garden City, N. Y., chairman of the Safety Code Sub-committee for Maintenance and Equipment of Airplanes, addressed the meeting on the subject of landing fields for both airplanes and seaplanes. Arthur Halstead, Bureau of Standards, Washington, Assistant Secretary, Sectional Committee for Aeronautical Safety Code, spoke on landing fields and seaplane stations, with particular reference to the city of Philadelphia. Capt. Burdette S. Wright, Air Service, showed for the first time the new moving picture of "The Model Airway."

The meeting was attended by Vice-President B. H. Mulvihill, Conway W. Cooke, Chairman, Membership Committee, and C. T. Ludington, of Philadelphia, all of the National Aeronautic Association, and jointly with the Engineers Club and Aero Club, steps were taken to form the Philadelphia Bureau of the National Aeronautic Association, the Bureau to be made up of delegates from the Boards of Trade, Chambers of Commerce, Civic Clubs, Engineers Clubs, Manufacturers Clubs, the Aero Club, and representatives of the city government.

With such backing it is hoped that a model airport may be established in Philadelphia within the next twelve months, this airport to accommodate land planes and seaplanes, and have available space for the erection of a mooring mast for rigid airships, when such ships are placed in commission in this country.

New Belgian Airway Rules

A decree regulating the practice of following officially recognized air routes in Belgium has recently been published in the *Moniteur Belge.*

Article 1 provides that an aircraft following an officially recognized route must conform to the following route-rules: (A) Keep the officially recognized route on the left; (B) Not approach to less than 100 meters of this route.

Article 2 states that if the commander of an aircraft judges it necessary to cross the officially recognized route, he must cross it at right angles at the highest altitude possible, and continue his flight at least ten kilometers from the route before continuing his original direction.

Article 3 provides that an aircraft flying below clouds must, in order to keep a good view, keep as far beneath the clouds as possible.

Article 4 gives the itinerary, in Belgium territory, of the official Brussels-London route as follows: Brussels (Haren), Hal, Ath, Tournai, the French-Belgian frontier to be crossed obligatorily between Baissieux the Armentières.

Demand for Streamline Wires

The Macwhyte Co. of Kenosha, Wis., manufacturers of wire rope, etc., in a letter to the Aeronautical Chamber of Commerce states that in 1922 increased aeronautical activities were noted in the number of streamline wire orders received. They say streamline wires for high speed planes are coming into greater use every day; and they expect that 1923 will show considerable increase.

Capt. Nesbitt with Fairchild Co.

The Fairchild Aerial Camera Corp., 136 West 52nd Street, New York City, announces the appointment of Capt. A. E. Nesbitt as General Manager. Captain Nesbitt is one of the best known figures in military aviation. For many months he was Purchasing Agent for the Air Service, stationed at Washington.

Aviation in Congress

Dec. 4, 1922 — Dec. 16, 1922

Dec. 4—*House.*

Helium resources of the U. S. would be conserved under a bill introduced on May 4, 1922, by the Chairman of the House Committee on Military Affairs and now pending before the Committe on Public Lands. During the week of Dec. 4 the committee held a hearing upon the bill at which testimony was received from members of the scientific staff of the Bureau of Mines. Other hearings may follow during the week of Dec. 11, at which time the committee may hear representatives of the air forces of the military and naval establishments (HR-11549) (From Chamber of Commerce of U. S. Legislative Bulletin No. 77)

Dec. 5—*Senate.*

Annual report of the National Advisory Committee for Aeronautics transmitted by the President. S. Doc. 270.

Dec. 6—*House.*

Annual report of National Advisory Committee for Aeronautics transmitted to the House.

Dec. 7—*House.*

Mr. Hicks. A bill (HR-13238) to authorize the Secretary of the Navy to procure, purchase, manufacture or construct additional aircraft for the Naval Establishment; to the Committee on Naval Affairs.

Dec. 9—*House.*

Reports of Committees on Public Bills and Resolutions. Mr. Hicks: Committee on Naval Affairs (HR-13238). A bill to authorize the Secretary of the Navy to procure purchase, manufacture, or construct additional aircraft for the Naval Establishment, without amendment (Rept. No. 1269). Referred to the Committee of the Whole House on the state of the Union.

Dec. 11—*House.*

Petition 6566. By Mr. Kissel: Petition of National Aeronautic Association of the U. S. of America, Washington, D. C., on a national policy for air; to the Committee on Interstate and Foreign Commerce.

Dec. 12—*House.*

Executive Communications Nos. 821, 822, and 823. Letters from the Chairman of the National Advisory Committee for Aeronautics giving items of expense of the N.A.C.A.

Dec. 14—*House.*

In discussing Naval Appropriations bill (HR-13374) Mr. Lanham asked the amount of money to be expended on helium in the Bureau of Aeronautics appropriation. $500,000 was the amount.

Dec. 16—*House.*

Mr. Campbell of Kansas submitted a privileged report House resolution 466 (Rept. No. 1280) "Resolved, That during the consideration of the bill HR-13374 making appropriations for the Navy Department and the naval service for the fiscal year 1924, it shall be in order to consider, without the intervention of a point of order, provisions of the bill or amendments thereto relating to appropriations to procure, purchase, manufacture or construct additional aircraft for the Naval Establishment, including the necessary spare parts and equipment therefor, at a total cost not exceeding $5,798,950, and also that part of the appropriation bill on page 55, lines 12 to 17 inclusive."

House.

In the Naval appropriation bill (HR-13374) a total sum of $14,647,174 was allotted to the Bureau of Aeronautics.

—*Aeronautical Chamber of Commerce*

U. S. Civil Service Examination

The U. S. Civil Service Commission announces the following open competitive examination:

Assistant Aeronautical Engineer, $2,000 to $2,400 a year
Associate Aeronautical Engineer, $2,500 to $2,880 a year
Aeronautical Engineer, $3,000 to $3,600 a year

The examinations are to fill vacancies in the Federal classified civil service throughout the United States. Receipt of applications will close on Jan. 30.

The duties of appointees will be to assist in, conduct, or supervise experimental and research tests, perform calculations, design aircraft, accessories, and equipment, carry out studies of aeronautical problems, and perform such specific work as designing and detailing structural parts of aircraft and their fittings, writing specifications, making weight, stability, and strength calculations, checking plans and specifications, and handling technical correspondence.

The United States Civil Service Commission also announces open competitive examination for the post of

Associate Mechanical Engineer (Internal Combustion Engines).

The examination is to fill a vacancy in the position of engineer of tests at $10.56 a day, for duty in the aeronautical engineering laboratory, Navy Yard, Washington, D. C., and other such vacancies should they occur later. The receipt of applications will close on Jan. 30.

The duties of the appointee will be to act as technical advisor to the officer in charge and to take actual control of testing and designing work.

Competitors for any of these examinations will not be required to report for examination at any place, but will be rated on their education, experience and fitness, on a scale of 100.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D. C., and the secretary of the board of U. S. civil service examiners at the post office or customhouse in any city.

Another Fine Record

The Aeromarine Airways Co. has flown a total of 739,047 passenger miles in the twelve months ending Nov. 1, 1922.

The performance compares very favorably with the showing of commercial air transport in any foreign country, for although more than 2000 regularly scheduled flights were made and a total of 9,107 passengers was carried, not a single accident occurred during the twelve month.

The table which follows gives the official figures on their operations from the start, that is Oct. 27, 1920.

OPERATION FIGURES OF AEROMARINE AIRWAYS, 1920-1922

	1920-21	*1921-22*
Passengers carried	6,814	9,107
Mail and freight, lb.	29,002	(*)
Miles flown	95,000	81,100
Accidents	NIL	NIL

* Not given.

The record established by the only company operating a regular air transport service in this country is made possible by self imposed regulations that should be laid down in federal statutes. Safety in the air is recognized by those who are concerned with aviation as a matter of dependability in pilots and careful attention to the airworthiness of the planes that they fly. Where these conditions are met safety is achieved. On the other hand the lack of legislative provision for the inspection of airplanes and the licensing of pilots denies to reliable commercial aviation companies in this country the measure of public confidence that such laws would insure.

The Aeromarine Airways have just opened an airport at San Juan, Porto Rico, and in January a line is to be established between San Juan and Kingston, Jamaica, connecting with Key West and Havana.

It is expected that several new routes will be opened during the year. Those now under consideration are: New York to Southampton, Newport, Providence and Boston; and on Lake Michigan out of Chicago.

ARMY AND NAVY AIR NEWS

Air Service

Scott Field Activities—A mosaic of the territory surrounding the Air Service Balloon and Airship School at Scott Field, Belleville, Ill., is to be made shortly, using photographic planes from Chanute Field, Rantoul, Ill. This aerial photographic map will cover an area of approximately 144 square miles, and will include Belleville, Mascoutah, O'Fallon, Lebanon, Shiloh, and Summerfield. The mosaic when completed will measure 40 inches square, with a scale of one over twenty thousand.

The new 800 ft. airship hangar at Scott Field is about ready to be turned over to the government. The work is entirely completed with the exception of a small block of concrete in front of the south door. The hangar has been used for the past two months for housing the Pony Blimp, the A4 and captive balloons. The hangar is the second largest in the United States, costing more than $1,200,000.

An interesting experiment was performed recently at the field with the airships A4 and Pony Blimp. The Pony Blimp, with its motor dead, was attached to the A4 with a 500 ft. ¼-in. rope and was towed by the latter ship for about ten miles. A safe landing was effected with the ships thus attached.

The course of instruction in airship piloting for student officers and cadets has been progressing rapidly. The A4 a one-man control ship is being used for this purpose. The ship has been kept busy giving one-man flights to those students of the Balloon and Airship School who finished their primary airship ground training at Ross Field last summer. The Pony Blimp has been used for practice flights by qualified airship pilots at the post.

A new meteorological station is being installed at Scott Field. This will be one of the most complete of the Air Service meteorological field stations, and will furnish data daily by radio to Selfridge Field, Chanute Field, and to the Weather Bureau at Chicago. Among the new instruments to be used in this station are the telethermoscope and the Carpenter hythergraph. Capt. Lawrence F. Stone, Post Meteorological Officer, will direct the operation of the new station, with Sgt. W. G. Wills in charge.

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Army Orders—First Lieut. Richard E. Thompson, A.S., to proceed home and await retirement.

The following named officers of the Air Service Officers' Reserve Corps are with their consent ordered to active duty for the purpose of pursuing a three months course of instruction as indicated.

Capt. Gordon Henry Keller, Philadelphia; First Lieut. Harold Eugene Mensch, Trenton, N. J.; Sec. Lieut. Lyman William Stanton, Buffalo, N. Y.; Sec. Lieut. Francis Cornelius Crowley, Dorchester, Mass.; Sec. Lieut. William Fred. Watson, jr., Newport, R. I. (Engine and plane maintenance, Engineering School, McCook Field.)

Capt. William Lucian Carbine, Tampa, Fla.; First Lieut. Ejner Christian Myland, Philadelphia; First Lieut. Arthur Leonard Johnson, Chicago; Sec. Lieut. Guy William Ade, Peoria, Ill.; Sec. Lieut. Walter A. Bowers, Chicago; Sec. Lieut. Sidney Wallace Park, Louisville, Ky. (Aerial photography, Technical School, Chanute Field.)

Capt. John Prewitt Nelson, Muskogee, Okla.; First Lieut. Harry Cleo Claiborne, Omaha, Neb.; First Lieut. Allen Chapman, Nevada City, Calif.; Sec. Lieut. Reuben Louis Wagner, Omaha, Neb.; Sec. Lieut. Charles Neff Burger, Los Angeles. (Communications, Chanute Field.)

At the expiration of the respective courses these officers will be relieved from active duty.

Capt. John W. Kelly, A.S., and Capt. Chester P. Dorland, A.S., to army retiring board for examination.

First Lieut. Robert H. Finley, A.S., from Langley Field to Carlstrom Field for course of instruction in heavier-than-air craft.

Capt. George F. MacDonald, A.S., (Inf.), relieved from detail in A.S. and assigned to 22nd Inf.

First Lieut. George H. Brown, A.S., from Chanute Field to Fort Sheridan, Ill., for treatment in station hospital.

Maj. Bert M. Atkinson, A.S., incapacitated for active service for disability incident thereto, is retired.

Resignation of First Lieut. Laurens Claude, A.S., is accepted by the President.

First Lieut. Warren R. Carter, A.S., from A.S. Mechanics School Chanute Field, to Panama Canal Zone.

Sec. Lieut. Richard Wilson Johnson, A.S., transferred to Coast Artillery Corps.

Maj. Oscar Westover, A.S., from O.C.A.S. to Brooks Field for training in heavier-than-air craft

First Lieut. Leroy Ponton de Arce, A.S., and First Lieut. Alvan G. Kincaid, A.S., from Kelly Field to Maxwell Field.

Maj. Horace M. Hickam, A.S., from O.C.A.S. to Kelly Field as assistant commandant of Advanced Flying School.

First Lieut. Lewis A. Dayton, A.S., from Fort Sam Houston to San Antonio A.I.D.

First Lieut. Corley P. McDarment, A.S., from Langley Field to O.C.A.S.

Capt. Ralph A. Gibson, A.S., from Scott Field to Balloon and Airship School for course of instruction.

Orders relating to First Lieuts. Cecil E. Archer and Frank Kehoe, jr., A.S., revoked.

First Lieut. Lewis R. P. Reese, A.S., to report to army retiring board.

First Lieut. Raymond R. Brown, A.S., from Wilbur Wright Field to Louisville, Ky., with Org. Res. of 5th Corps Area.

First Lieut. Harvey W. Cook, A.S., from College Point, L. I., to McCook Field.

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Air Service Reserve Officers Purchase Airplanes—Many reserve aviators, commercial pilots and others are taking advantage of the sale of "Jennys" at the Rockwell Air Intermediate Depot, Coronado, Calif., and the lower end of the line resembles the test field of a wartime aircraft factory. Fliers from points as far away as Wyoming and Louisiana have bought planes, set them up and started on their homeward journeys. All day long, including Sundays, there are "Jennys" buzzing around on their initial flights and trials, making ready for the "cross-countries" to their future homes.

Coming Aeronautical Events

FOREIGN

1923

March 15 — *Entries close for Dutch Height Indicator Competition.*

June — *International Aero Congress, London.*

July 20-*Aug.* 12 — *International Aero Exhibition, Gothenburg, Sweden.*

Dec. 1 — *Entries close for French Engine competition.*

Controllability and Maneuverability of Airplanes

N.A.C.A. Report No. 153

This investigation was carried out by F. H. Norton and W. G. Brown for the National Advisory Committee for Aeronautics at Langley Field for the purpose of studying the behavior of the JN4h airplane in free flight under the action of its controls and from this to arrive at satisfactory definitions and coefficients for controllability and maneuverability. The method consisted in recording the angular velocity about the three axis, together with the airspeed, control positions, and acceleration. An analysis of the records leads to the following results:

1. Both the maximum angular velocity and maximum angular acceleration are proportional to the displacement of the controls.

2. Both the maximum angular velocity and maximum angular acceleration for a given control movement increase with the airspeed, rapidly immediately above the stalling speed, then nearly proportional to the speed.

3. The time required to reach each maximum angular velocity is constant for all airspeeds and control displacements for a given airplane.

4. The minimum time required to reverse the direction of an airplane by a steeply banked turn is a rough indication of its general maneuverability.

5. Doubling the lateral moment of inertia of an airplane increases the time required to bank at 90 deg., with a maximum control angle, by only 10 per cent.

6. Controllability has been defined as applying to the moment produced about the center of gravity by the action of the controls and maneuverability as the resultant motion.

7. A simple method is described for measuring controllability coefficients and maneuverability coefficients.

These results are of practical value, as they give a quantitative means of measuring airplane maneuverability and controllability, which will allow designers to accurately compare the merits of different airplanes.

A copy of report No. 153 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

Damping Coefficients Due to Tail Surfaces in Aircraft

N.A.C.A. Report No. 136

The object of the investigation described in this report, by Lynn Chu, was to compare the damping coefficient of an airfoil as calculated from a knowledge of the static characteristics of the section with those obtained experimentally with an oscillation. The damping coefficients so obtained, according to the conventional notation, can be considered either as due to pitching or as due to yawing, the oscillation in these experiments being so arranged that the surfaces oscillate about a vertical axis. This is in reality the case when the influence is yawing about the standard Z-axis, but it can also be considered as a pitching motion when the model is so rigged that its standard Y-axis becomes vertical. This horizontal oscillation has the advantage of eliminating the gravity action and avoiding the use of counterweights, whose presence in the wind tunnel is undesirable because of their interference with the air flow.

The real point of the investigation was to separate the damping due to rotation from that due to translation. By varying the distance between the center of pressure and the center of rotation on the oscillator, the variation of damping moment can be observed and the rotational and translational effects can be separated.

The report is presented in three parts: Part I. Theoretical Damping Coefficients; Part II. Experimental Damping Coefficients; Part III. Comparison of Calculated and Experimental Damping Coefficients.

A copy of report No. 136 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

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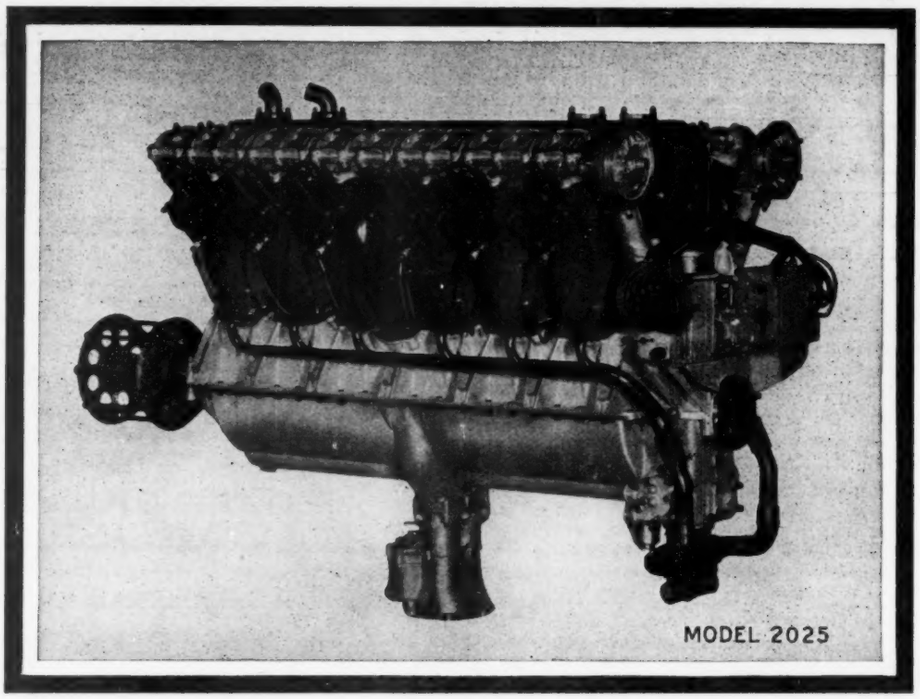

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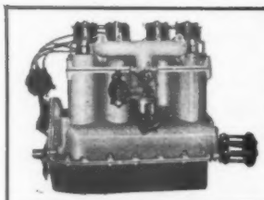

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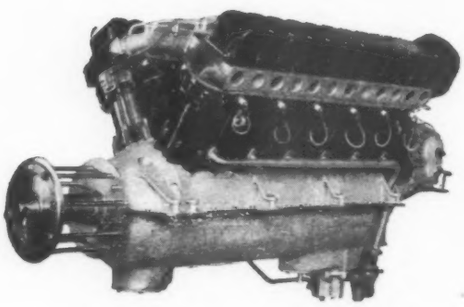

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